

## New Jersey Institute of Technology Digital Commons @ NJIT

---

Mechanical and Industrial Engineering Syllabi

NJIT Syllabi

---

Fall 2019

# ME 438-HM1: Introduction to Physical Metallurgy

Veljko Samardzic

Follow this and additional works at: <https://digitalcommons.njit.edu/mie-syllabi>

---

### Recommended Citation

Samardzic, Veljko, "ME 438-HM1: Introduction to Physical Metallurgy" (2019). *Mechanical and Industrial Engineering Syllabi*. 120.  
<https://digitalcommons.njit.edu/mie-syllabi/120>

This Syllabus is brought to you for free and open access by the NJIT Syllabi at Digital Commons @ NJIT. It has been accepted for inclusion in Mechanical and Industrial Engineering Syllabi by an authorized administrator of Digital Commons @ NJIT. For more information, please contact [digitalcommons@njit.edu](mailto:digitalcommons@njit.edu).

<b>COURSE NUMBER</b>	<b>ME 438</b>		
<b>COURSE TITLE</b>	<b>Introduction to Physical Metallurgy</b>		
<b>COURSE STRUCTURE</b>	(3-0-3) (lecture hr/wk - lab hr/wk – course credits)		
<b>COURSE COORDINATOR</b>	<b>Veljko Samardzic</b>		
<b>COURSE DESCRIPTION</b>	Introduction to metallic microstructures, solid solutions and the mechanical properties of metals and alloys. Physical understanding of diffusion processes is emphasized in covering the relationship between the nature of metals and different heat treating processes.		
<b>PREREQUISITE(S)</b>	Chem 126 – General Chemistry II, ME-215 Engineering Materials and Processes		
<b>COREQUISITE(S)</b>	None		
<b>REQUIRED, ELECTIVE OR SELECTED ELECTIVE</b>	Elective		
<b>REQUIRED MATERIALS</b>	Herman W. Polack, Materials Science and Metallurgy, 4 <sup>th</sup> Edition, A Reston Book, A Pearson Education Company, NJ, 1988.		
<b>Other supplemental materials (not Required)</b>	<ol style="list-style-type: none"> <li>1. William D. Callister, Jr., Materials Science and Engineering: An Introduction. John Wiley and Sons, Inc., NY, 8<sup>th</sup> Edition, 2010.</li> <li>2. E. Paul De Garmo, J.T. Black, R.A. Kohler. Materials and Processes in Manufacturing, 10<sup>th</sup> Edition, MacMillan, NY, 2008</li> </ol>		
<b>COMPUTER USAGE</b>	Use of NJIT Library search sources and engines for materials and metallurgy research purpose and practical implications to project execution and presentation. Use of computer software for microstructure analysis.		
<b>COURSE LEARNING OUTCOMES/ EXPECTED PERFORMANCE CRITERIA:</b>	Course Learning Outcomes	SOs <sup>*</sup>	Expected Performance Criteria
	1 <b>apply</b> principles of quantum mechanics to materials engineering practice.	1, 2, 4	<b>Exam Question</b> (80% of the students will earn a grade 70% or better on this question)
	2 <b>apply</b> material transport in engineering solids phenomena to solid solution alloying practice.	1, 2, 4, 7	<b>Exam Question</b> (80% of the students will earn a grade 70% or better on this question)
	3 <b>characterize</b> microstructure of engineering alloys using optical microscopy and image analyzer.	1, 2, 4	<b>Project Report</b> (80% of the students will earn a grade 70% or better on this question)
	4 <b>apply</b> web based search engines and internet application principles	1, 2, 4	<b>Project Report</b> (80% of the students will earn a

	to information acquisition for advanced materials engineering.		grade 70% or better on this question)				
	5 <b>explore and apply</b> interdependence of microstructure and materials properties to practice of materials engineering.	1, 2, 4	<b>Exam Question</b> (80% of the students will earn a grade 70% or better on this question)				
	6 <b>design</b> new alloys or select new alloy for required.	1, 2, 4	<b>Project Report</b> (80% of the students will earn a grade 70% or better on this question)				
	7 <b>select</b> a desired material for engineering component design.	1, 2, 4, 7	<b>Project Report</b> (80% of the students will earn a grade 70% or better on this question)				
	8 <b>describe</b> the mechanical properties of different steels, cast iron and nonferrous metals and alloys, ceramics and composites	1, 2, 4	<b>Exam Question</b> (80% of the students will earn a grade 70% or better on this question)				
	9 <b>select</b> appropriate heat treating process to modify properties of alloys	1, 2, 4	<b>Exam Question</b> (80% of the students will earn a grade 70% or better on this question)				
CLASS TOPICS	1. Introduction: Basic Atomic Structure & Crystalline Solids; The Solid State; Forming of Engineering Materials. 2. Materials from the Elements. 3. Fundamentals of Metal Alloys; Equilibrium Diagrams. 4. Testing of Engineering Materials. 5. Heat Treatment of Metals. 6. Classification of Steels. Material Selection for Designed Product. 7. Manufacturing Processes. Material Deformation Processes 8. Casting, Welding, Powder Metallurgy and Their Influence on the Design Aspects of Machine Components. 9. Measurement, Inspection, System of Fits, Computer Controlled Inspected Stations. 10. Theory of Cutting. 11. Machining Processes: Conventional and Computer Controlled.						
STUDENT OUTCOMES (SCALE: 1-3)	1	2	3	4	5	6	7
	3	3		3			3
3 – Strongly supported                      2 – Supported   1 – Minimally supported							